

1. ES413 Digital Control Systems
2. 3 credit hours, 2 recitation hours, 2 laboratory hours
3. Course coordinator: Assoc Prof Matthew Feemster
4. Textbook: Control Systems Engineering: seventh edition, Norman S. Nise, 2015
5. Specific course information
 - a. This course provides a focused exposure on the holistic process of design, analysis, and implementation of digital controllers on embedded processors. A semester long hardware based project is employed to support course material at the appropriate time within this process.
 - b. Prerequisites: ES305 or ES305H and ES306 or ES306H.
 - c. Elective course
6. Specific goals for the course
 - a. At the conclusion of the course, students will be able to:
 - Acquire/locate/comprehend high fidelity (nonlinear) mathematical models for select systems.
 - Develop test plans and/or appropriate methodology for obtainment of system parameter values.
 - Simulate nonlinear system models within the MATLAB SIMULINK software environment.
 - Develop a linearized system model representation (transfer function/state space space).
 - Design digital compensators within Z-domain.
 - Develop corresponding digital (difference) equations.
 - Simulate difference equations against nonlinear model within MATLAB SIMULINK software environment.
 - Develop/construct hardware environment (component integration and interfacing) for digital control implementation.
 - b. This course addresses the following student outcomes:
 - (b) experimental verification

- (c) practical design and implementation of a heading controller for a micro-autonomous surface vessel.

7. Topics covered:

- Nonlinear models
- System identification
- Z-transform
- Digital control design
- Simulation and analysis
- Component integration and interfacing for digital control system implementation